

6 TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

Many of the voluntary stations do not have standard thermometers or shelters.

The distribution of mean temperature over the United States and Canada for August, 1891, is exhibited on Chart II by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Weather Bureau. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the average for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Weather Bureau represents the mean of the maximum and minimum temperatures.

The mean temperature was highest in the Colorado Desert, California, and the lower Gila valley, Arizona, where it was above 95, and the mean values were above 80 on the Atlantic coast south of the 33d parallel, along the Gulf coast, over the greater part of east and south Texas, and from southwest Arizona over the San Joaquin and Sacramento valleys. The mean temperature was lowest in the lower Saint Lawrence valley, and at mountain stations in central Colorado, where it was 55 or below, and the mean readings were below 60 along the immediate Pacific coast north of San Francisco, Cal., and north of a line traced from Alberta south of east to the Gulf of Saint Lawrence.

DEPARTURES FROM NORMAL TEMPERATURE.

The mean temperature was generally above the normal along the immediate Atlantic coast, over the Lake region, in the middle and upper Rio Grande valleys, and along the Pacific coast and thence over the west part of the middle and northern plateau regions. In the central valleys and along the Saint Lawrence River the month was cooler than usual. The greatest departure above the normal temperature occurred along the Pacific coast and on the south New England and Nova Scotia coasts, where it was more than 2, and at stations on the north Pacific coast the departure was 4. The most marked departure below the normal temperature was noted in the interior of the west Gulf states, in the middle Ohio valley, and southeast Iowa, where it was more than 2, and it exceeded 3 in north Louisiana and south Arkansas.

At stations on the Pacific coast and at Hatteras, N. C., the month was the warmest August on record. On the north Pacific coast the mean temperature was from 1 to 2 above the highest mean previously reported for August, noted in 1884 and 1888; at San Francisco, Cal., the mean was 0.4 above that of 1890; and on the south Pacific coast the mean was 1 to 2 above the record of 1885 and 1888. At Shreveport, La., the mean temperature was as low, and at Abilene, Tex., it was lower than previously noted for August.

TEMPERATURE, JANUARY TO AUGUST.

For the period January to August, 1891, inclusive, the mean temperature averaged about normal in the middle, south Atlantic, and east Gulf states, the Rio Grande and upper Mississippi valleys, the Ohio Valley and Tennessee, and along the middle and south Pacific coasts. In New England, the Lake region, the extreme northwest, and over the northern plateau region the mean temperature was about 1 above the normal; at Key West, Fla., on the eastern slope of the Rocky Mountains, and over the southern and middle plateau regions it averaged about 2 below the normal, and in the west Gulf states and the Missouri Valley it averaged about 1 below the normal for the period named.

MAXIMUM TEMPERATURE.

The maximum temperature was highest in the Colorado Desert, California, and in the lower Gila valley, Arizona, where it rose above 120; it was above 110 in adjoining parts of southeast California and west Arizona, and in the San

Joaquin and Sacramento valleys, California; and it was above 100 in Texas west of the 98th meridian, thence westward over extreme south New Mexico and southern Arizona, and thence northwest over the central valleys of California. It was also above 100 in the valley of the Columbia River in southeast Washington. Reports from voluntary observers show maximum temperature above 100 in all states and territories, except in New England and along the Atlantic coast. The lowest maximum temperature was reported on the coast of north California and in extreme northwest Washington, where it was below 75, and the maximum values were below 80 on the coast of eastern Maine.

MINIMUM TEMPERATURE.

The lowest minimum temperature reported by a regular station of the Weather Bureau was 32 at Saint Vincent, Minn., and the temperature fell below 40 in the upper and middle Missouri and Red River of the North valleys and in north Iowa. The minimum temperature was highest in the lower Colorado and Gila valleys and over the Florida Peninsula, where it was 70 or above.

PERIODS OF HIGH TEMPERATURE.

A warm wave appeared over the Dakotas on the 7th, extended over the Lake region and the Ohio Valley during the 8th and 9th, and reached the middle Atlantic states and New England on the 10th, where the temperature continued exceptionally high until after the 12th. At a number of stations in the upper Mississippi valley, the Lake region, New York, and south New England this warm wave was attended by the highest temperature ever noted for August, and a large number of deaths and prostrations were caused by the excessive heat. Very warm weather prevailed over Missouri, Kansas, and Indian Territory from the 18th to 20th. During the third decade of the month exceptionally warm weather prevailed on the Pacific coast, and at a number of stations in central and north California, Oregon, and south Washington the maximum temperature was the highest ever reported for August.

PERIODS OF LOW TEMPERATURE.

On the 23d a cool wave extended from Montana and the Dakotas to north Texas. On the 24th this cool wave extended over the upper and middle Mississippi valleys, and reached the Ohio Valley and the east Gulf states by the 25th. This cool wave was attended by the lowest temperature ever noted for August in the central valleys. On the 26th a cool wave appeared over Manitoba and North Dakota, and by the 27th it had extended over South Dakota and Minnesota, on the 28th over the Lake region and Ohio Valley, and on the 29th to the middle Atlantic coast. This cool wave was attended by the lowest temperature ever reported for August at stations in the Lake region, the Ohio Valley, and Virginia.

TEMPERATURE RANGES.

The greatest daily ranges of temperature are shown in the table of miscellaneous meteorological data. The greatest monthly ranges occurred over the middle Missouri valley, where they exceeded 60, whence they decreased eastward to less than 30 on the southeast New England coast, southeastward to less than 30 along the immediate south Atlantic coast and over the Florida Peninsula, southward to less than 30 along the immediate west Gulf coast, southwestward to less than 30 on the extreme south Pacific coast, and westward to less than 30 along the immediate Pacific coast north of the 40th parallel.

DEVIATIONS FROM NORMAL TEMPERATURE.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for August for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for August, 1891; (4) the departure of the current month from the normal;

(5) and the extreme monthly mean for August, during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of Aug.	(2) Length of record.	(3) Mean for Aug., 1891.	(4) Departure from normal.	(5) Extreme monthly mean for August.			
						Highest.	Year.	Lowest.	Year.
<i>Arkansas.</i>		°	Years	°	°	°		°	
Lead Hill	Boone	77.9	9	77.7	- 0.2	81.0	1886	75.5	1882
<i>California.</i>									
Sacramento	Sacramento	71.4	38	69.0	- 2.4	76.0	1866	66.2	1887
<i>Connecticut.</i>									
Middletown	Middlesex	73.8	19	70.0	- 3.8	73.0	1870	65.9	1861
<i>Florida.</i>									
Merritts Island	Brevard	81.2	9	83.4	+ 2.2	83.8	1883	78.8	1889
<i>Georgia.</i>									
Forsyth	Monroe	78.8	17	78.7	- 0.1	82.4	1878	73.2	1885
<i>Illinois.</i>									
Peoria	Peoria	75.4	35	72.2	- 3.2	80.5	1881	70.1	1866
Riley	McHenry	68.7	35	67.8	- 0.9	73.4	1867	64.1	1885
<i>Iukana.</i>									
Vevay	Switzerland	74.9	25	72.2	- 2.7	80.7	1881	69.9	1875
<i>Iowa.</i>									
Cresco	Howard	68.9	18	65.8	- 3.1	72.6	1881	63.1	1885
Monticello	Jones	70.0	37	68.1	- 1.9	77.1	1861	64.3	1863
Logan	Harrison	73.4	17	72.1	- 1.3	79.6	1881	68.2	1875
<i>Kansas.</i>									
Lawrence	Douglas	75.3	23	72.5	- 2.8	83.4	1874	71.1	1884
Wellington	Sumner	76.7	12	.....	.....	82.6	1881	70.1	1884
<i>Louisiana.</i>									
Grand Coteau	Saint Landry	81.3	8	.....	.....	83.6	1883	78.9	1889
<i>Maine.</i>									
Orono	Penobscot	65.3	21	66.2	+ 0.9	67.5	1881	63.1	1874
<i>Maryland.</i>									
Cumberland	Allegany	69.8	32	70.5	+ 0.7	75.7	1871, '72	63.6	1866
<i>Massachusetts.</i>									
Amherst	Hampshire	67.3	55	68.5	+ 1.2	71.6	1872	63.5	1866
Newburyport	Essex	66.9	13	68.3	+ 1.4	69.5	1882	65.3	1889
Somerset	Bristol	71.6	19	74.7	+ 3.1	75.0	1877	68.6	1874
<i>Michigan.</i>									
Kalamazoo	Kalamazoo	69.2	14	70.0	+ 0.8	73.0	1881	63.8	1885
Thornville	Lapeer	69.3	14	68.8	- 0.5	74.5	1881	64.7	1885
<i>Minnesota.</i>									
Minneapolis	Hennepin	67.9	26	67.4	- 0.5	72.3	1881	63.8	1885
<i>Montana.</i>									
Fort Shaw	Lewis & Clarke	64.8	21	.....	.....	69.8	1882	53.7	1873
<i>New Hampshire.</i>									
Hanover	Grafton	65.8	45	64.6	- 1.2	70.4	1881	59.2	1885
<i>New Jersey.</i>									
Moorestown	Burlington	72.0	28	71.9	- 0.1	76.1	1864	68.1	1883
South Orange	Essex	70.7	20	70.8	+ 0.1	74.5	1877	68.1	1883, '89
<i>New York.</i>									
Cooperstown	Otsego	65.5	37	66.0	+ 0.5	71.5	1877	61.0	1861
Palermo	Oswego	66.8	31	67.3	+ 0.5	71.6	1877	61.6	1885
<i>North Carolina.</i>									
Lenoir	Caldwell	73.2	18	72.6	- 0.6	77.0	1877	70.0	1890
<i>Ohio.</i>									
N'th Lewisburgh	Champaign	70.7	59	71.9	+ 1.2	75.0	1880	64.0	1876
Wauseon	Fulton	69.3	21	69.9	+ 0.6	72.8	1872	63.0	1870
<i>Oregon.</i>									
Albany	Linn	65.7	13	67.2	+ 1.5	68.7	1888	62.5	1881
Eola	Polk	64.9	21	66.4	+ 1.5	68.6	1870	61.2	1881

Deviations from normal temperature—Continued.

State and station.	County.	(1) Normal for the month of Aug.	(2) Length of record.	(3) Mean for Aug., 1891.	(4) Departure from normal.	(5) Extreme monthly mean for Aug.			
						Highest.	Year.	Lowest.	Year.
<i>Pennsylvania.</i>		°	Years	°	°	°		°	
Dyberry	Wayne	64.3	23	65.0	+ 0.7	68.3	1872	58.4	1866
Grampian Hills	Clearfield	67.5	27	67.5	- 0.0	73.1	1881	62.1	1866
Wellsborough	Tioga	65.7	12	62.0	- 3.7	71.3	1881	62.0	1891
<i>South Carolina.</i>									
Statesburgh	Sumter	76.7	10	75.3	- 1.4	79.7	1881	73.5	1889
<i>Tennessee.</i>									
Austin	Wilson	78.6	20	76.4	- 2.2	84.6	1881	75.8	1889
<i>Texas.</i>									
New Urm	Austin	82.4	19	81.8	- 0.6	84.4	1873	79.4	1879, '82
<i>Vermont.</i>									
Strafford	Orange	67.5	18	67.0	- 0.5	72.6	1884	63.9	1885
<i>Virginia.</i>									
Birdsnest	Northampt'n	76.5	23	77.6	+ 1.1	80.1	1877, '78	65.3	1871
<i>Washington.</i>									
Fort Townsend	Jefferson	61.4	18	61.2	- 0.2	64.3	1874	58.9	1876
<i>Wisconsin.</i>									
Madison	Dane	68.9	19	68.4	- 0.5	72.2	1878	64.2	1885

FROST.

Attending a cool wave with unprecedented low temperature for the season in the Gulf States and from the Mississippi River to the Rocky Mountains, frost was reported from the Missouri and Arkansas valleys to the Lake Superior region from the 21st to 24th. In the states of the middle Missouri and extreme upper Mississippi valleys the frost of this period damaged crops and tender vegetation. During the 28th and 29th a cool wave extended over the Lake region and thence over the Ohio Valley and the middle Atlantic states, attended at stations in the Lake region, the Ohio Valley, and Virginia by the lowest temperature ever noted for August, and frost from Manitoba and the Dakotas over the Lake region to extreme western New York. On the 28th temperature below freezing was reported in north and west-central parts of Wisconsin, and on the 29th ice $\frac{1}{2}$ inch thick was reported at Crandon, Wis.

Records for the last 10 years show the occurrence in August of damaging frost in Michigan for 5 years, in the Dakotas for 4 years, in New York, Minnesota, and Pennsylvania for 3 years, in Wisconsin, Nebraska, and Iowa for 2 years, and in Montana, Illinois, Massachusetts, New Hampshire, and Vermont for one year.

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada, for August, 1891, as determined from the reports of nearly 2,000 stations, is exhibited on Chart III. In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for regular stations of the Weather Bureau. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

The monthly precipitation was greatest in areas from the lower Missouri valley to the south Atlantic states and Florida. In southern Virginia and thence over the south Atlantic states, in west-central and extreme southern Florida, and from north-central Missouri over south-central Iowa it exceeded 10.00, and more than 8.00 was reported in areas in the middle Ohio valley, southeast Kentucky, and northern and eastern Tennessee. Over the greater part of California and at stations in the middle plateau region no precipitation was reported, and over the greater part of the middle and northern plateau regions, on the northeast slope of the Rocky Mountains, and in areas in south Texas, Indian Territory, Kansas, east Nebraska, the

lower Mississippi valley, and on the east Gulf coast less than 1.00 fell.

A notable feature of the month was the distribution of precipitation in Arizona and southern California. In Arizona the rainfall exceeded 5.00 in the mountains south of Prescott and in the southeastern part of the territory, while at points in the Gila Valley no rain fell. In southern California heavy rain storms, resulting in destructive floods, occurred in the mountains in the southwest part of San Bernardino county and in San Diego county, while on the neighboring coast no precipitation occurred. The irregular distribution of precipitation from the Missouri Valley to the Atlantic coast was also due to the heavy downpours of rain in limited areas which characterize summer storms.

DEPARTURES FROM NORMAL PRECIPITATION.

East of the Rocky Mountains the areas of excess and deficiency were irregularly distributed. The monthly precipitation was generally in excess of the normal along the Pacific coast, over the northern plateau region and the east part of middle plateau region, in the upper Mississippi and lower Ohio valleys, in adjoining parts of northeast Texas and northwest Louisiana, over the northern part of the Lake region, in